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Sorotokin et al.

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(54) **DIGITAL RIGHTS MANAGEMENT RETRIEVAL SYSTEM**

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H04L 9/32	(2006.01)
G06F 21/10	(2013.01)

(52) **U.S. Cl.**

CPC ***H04L 63/08*** (2013.01); ***G06F 21/10*** (2013.01); ***H04L 9/3263*** (2013.01); ***H04L 63/123*** (2013.01); *H04L 2209/603* (2013.01); *H04L 2463/101* (2013.01)

(58) **Field of Classification Search**

USPC 713/162

See application file for complete search history.

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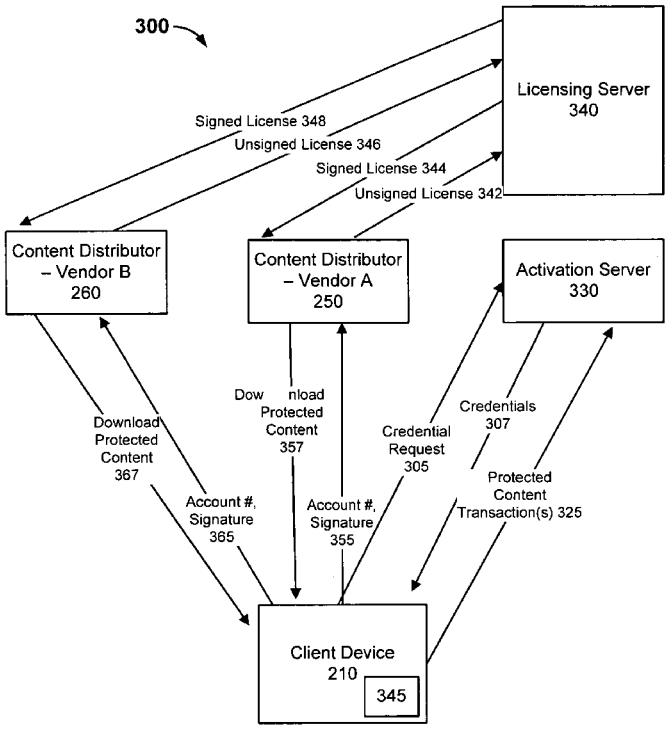
(57) **ABSTRACT**

A digital rights management retrieval system is provided. In some embodiments, a digital rights management system includes receiving a first notification from a first client device of a first protected content transaction for a first user with a first content distributor, wherein the first notification includes a first network address for the first content distributor; receiving a second notification from the first client device of a second protected content transaction by the first user with a second content distributor, wherein the second notification includes a second network address for the second content distributor; and maintaining a first list of content distributors for the first user, wherein the first list includes a network address for each content distributor from which the first user has downloaded protected content.

21 Claims, 11 Drawing Sheets



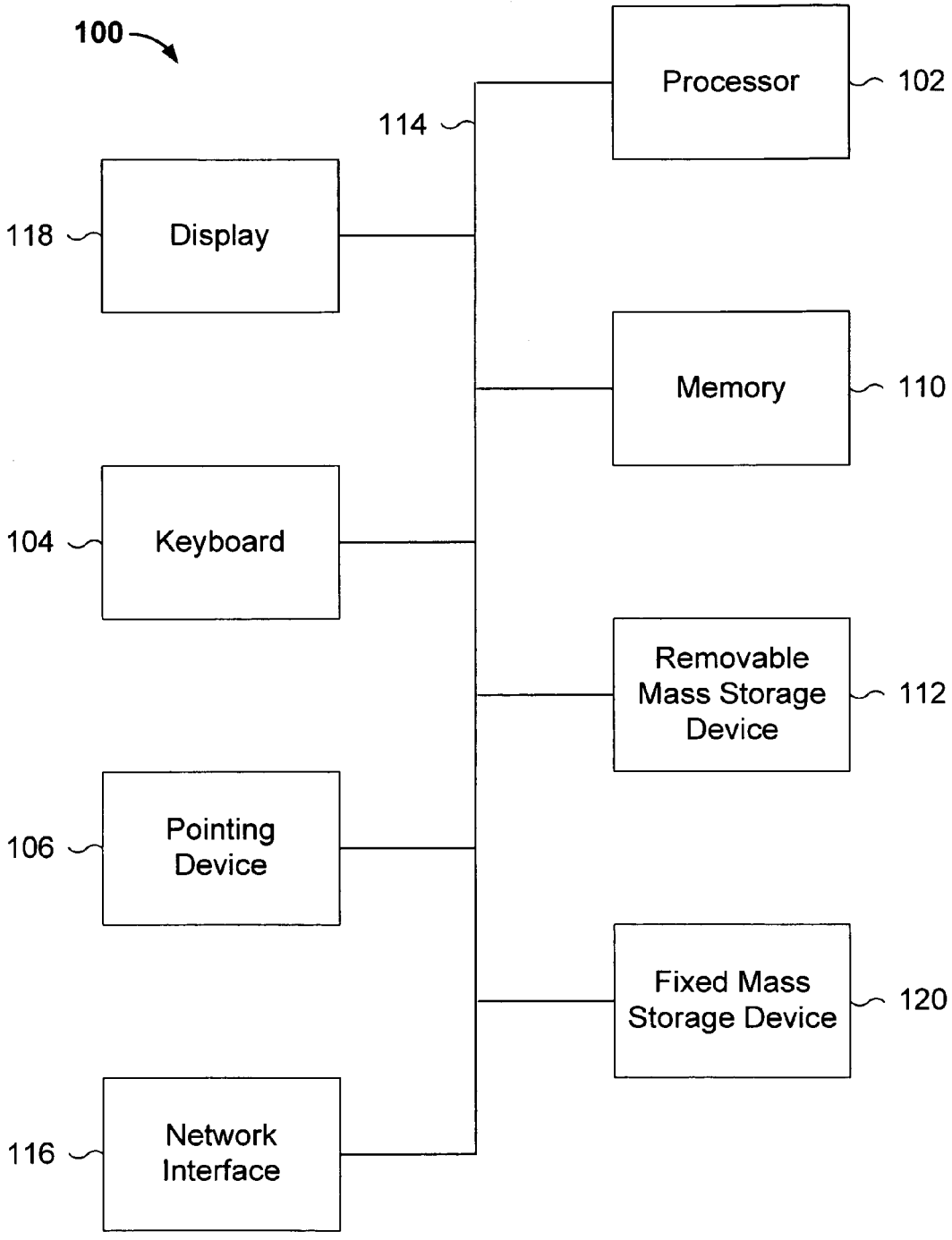

100
Processor
102
114
Display
118
Memory
110
Keyboard
104
Removable Mass Storage Device
112
Pointing Device
106
Fixed Mass Storage Device
120
Network Interface
116

FIG. 1

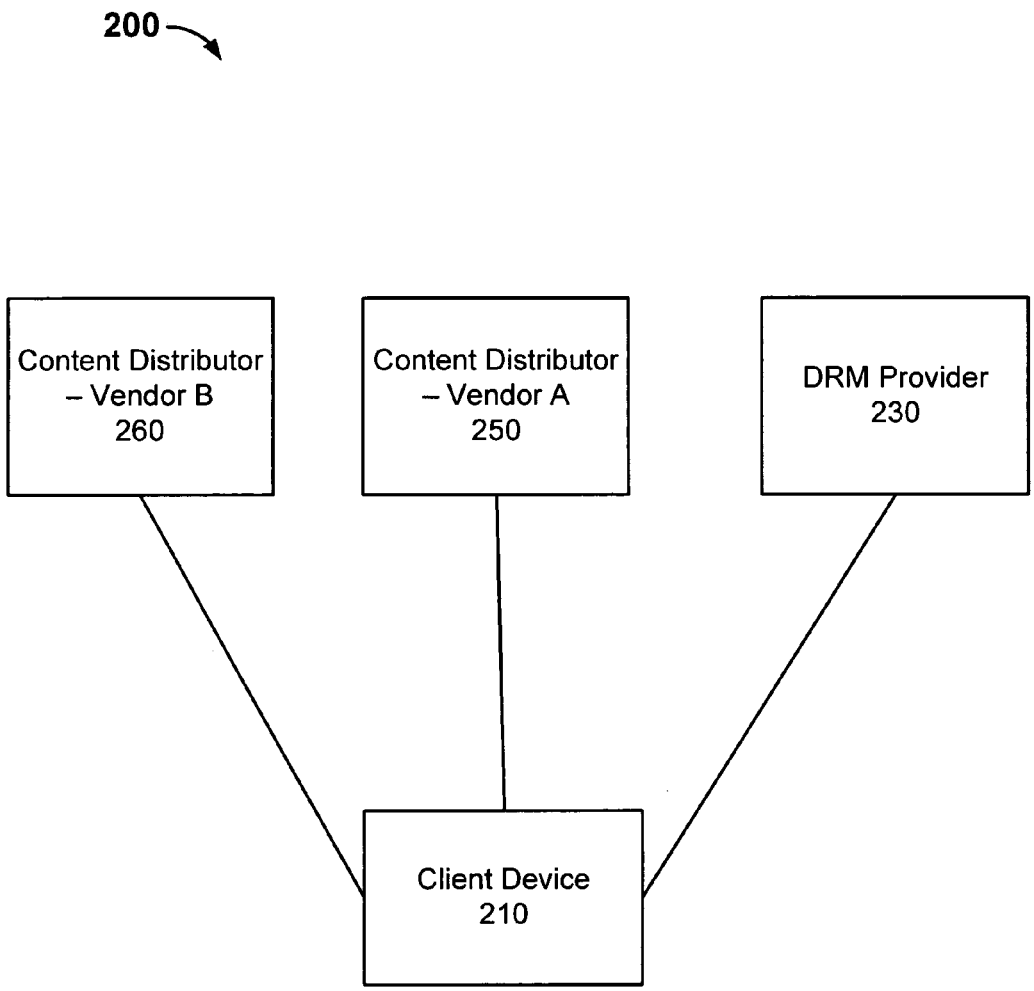

200
Content Distributor – Vendor B 260
Content Distributor – Vendor A 250
DRM Provider 230
Client Device 210

FIG. 2

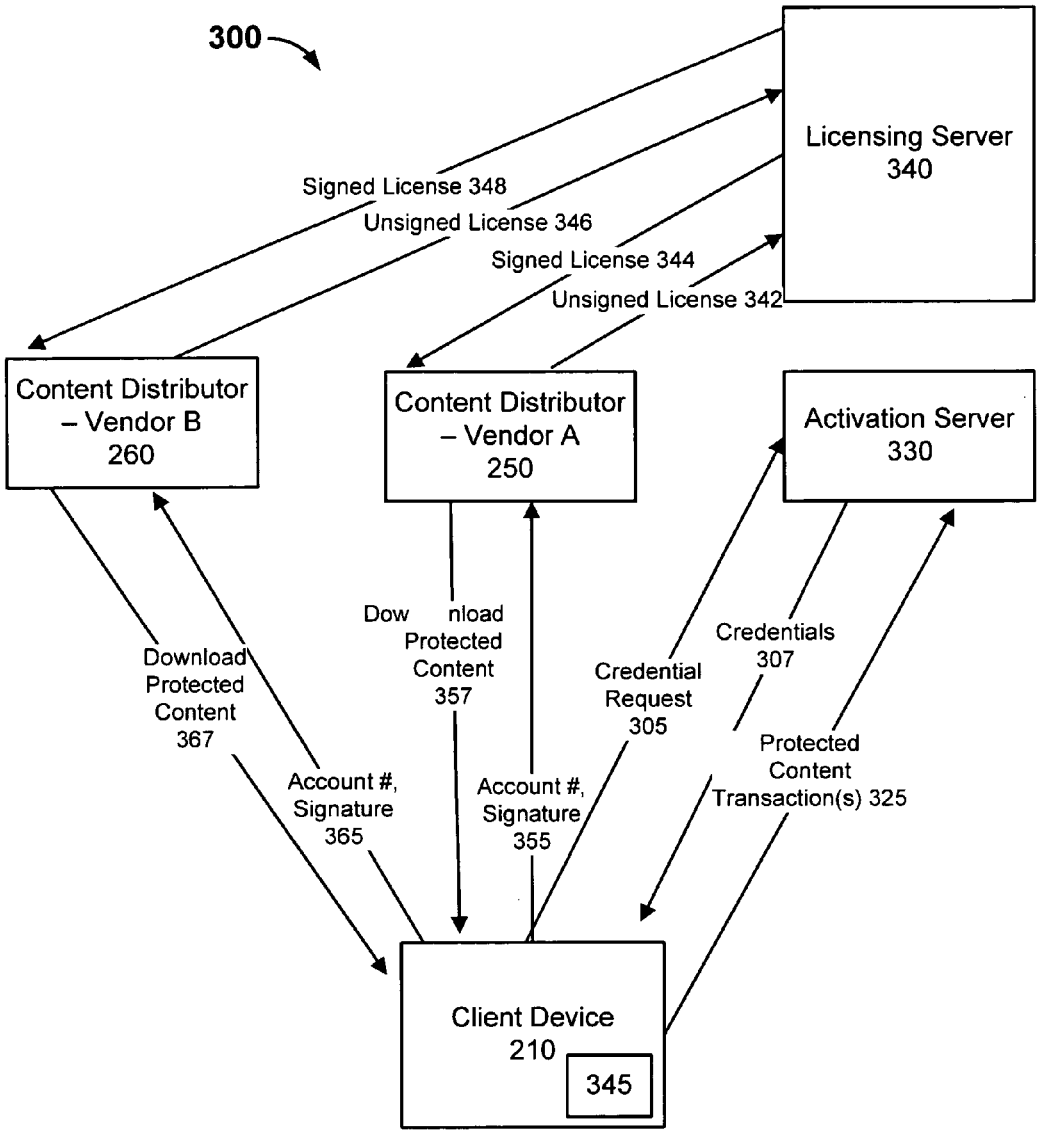

300
Licensing Server 340
Signed License 348
Unsigned License 346
Signed License 344
Unsigned License 342
Content Distributor – Vendor B 260
Content Distributor – Vendor A 250
Activation Server 330
Download Protected Content 367
Account #, Signature 365
Dow nload Protected Content 357
Account #, Signature 355
Credential Request 305
Credentials 307
Protected Content Transaction(s) 325
Client Device 210
345

FIG. 3

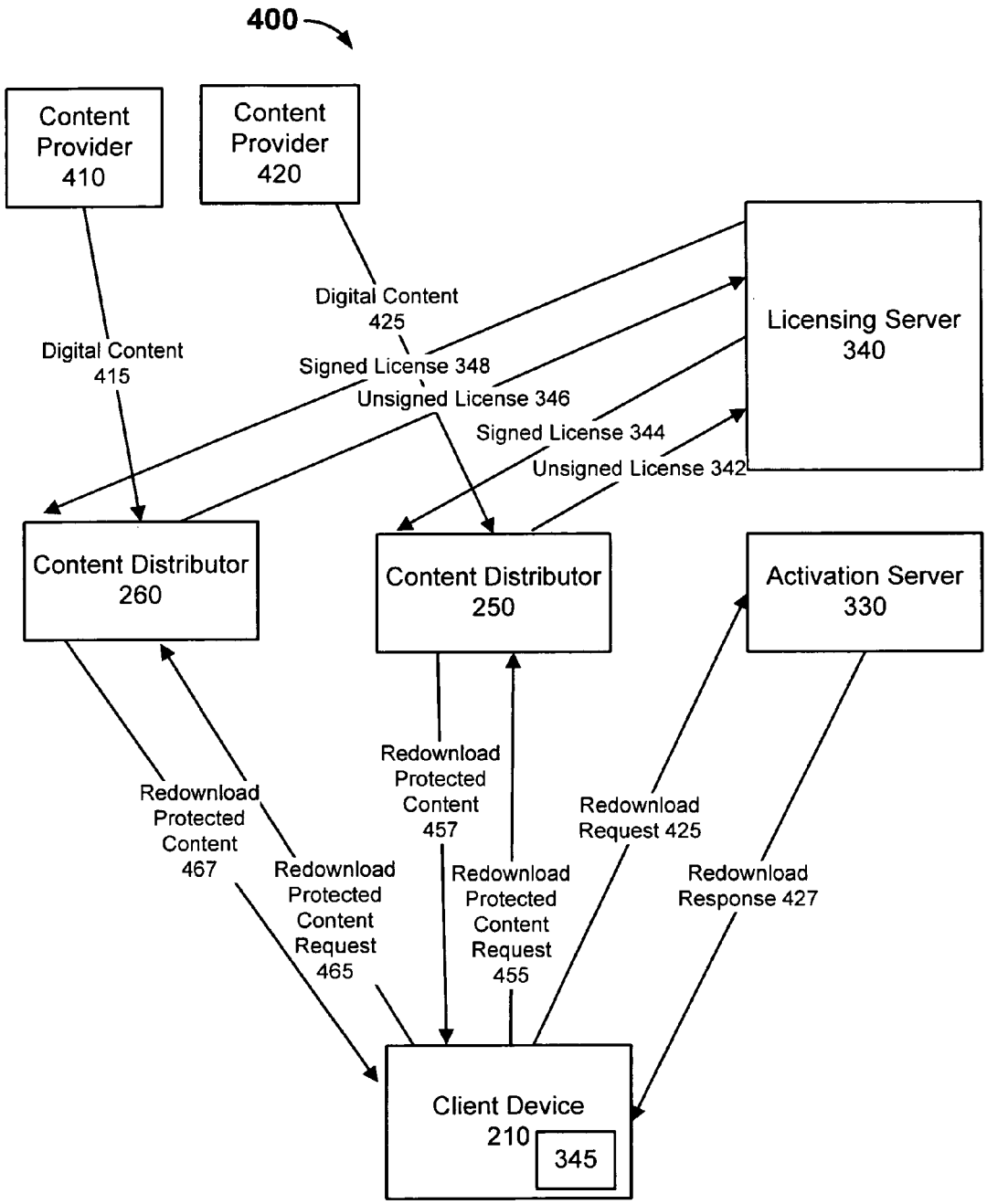

400
Content Provider 410
Content Provider 420
Licensing Server 340
Digital Content 415
Digital Content 425
Signed License 348
Unsigned License 346
Signed License 344
Unsigned License 342
Content Distributor 260
Content Distributor 250
Activation Server 330
Redownload Protected Content 467
Redownload Protected Content Request 465
Redownload Protected Content 457
Redownload Protected Content Request 455
Redownload Request 425
Redownload Response 427
Client Device 210
345

FIG. 4

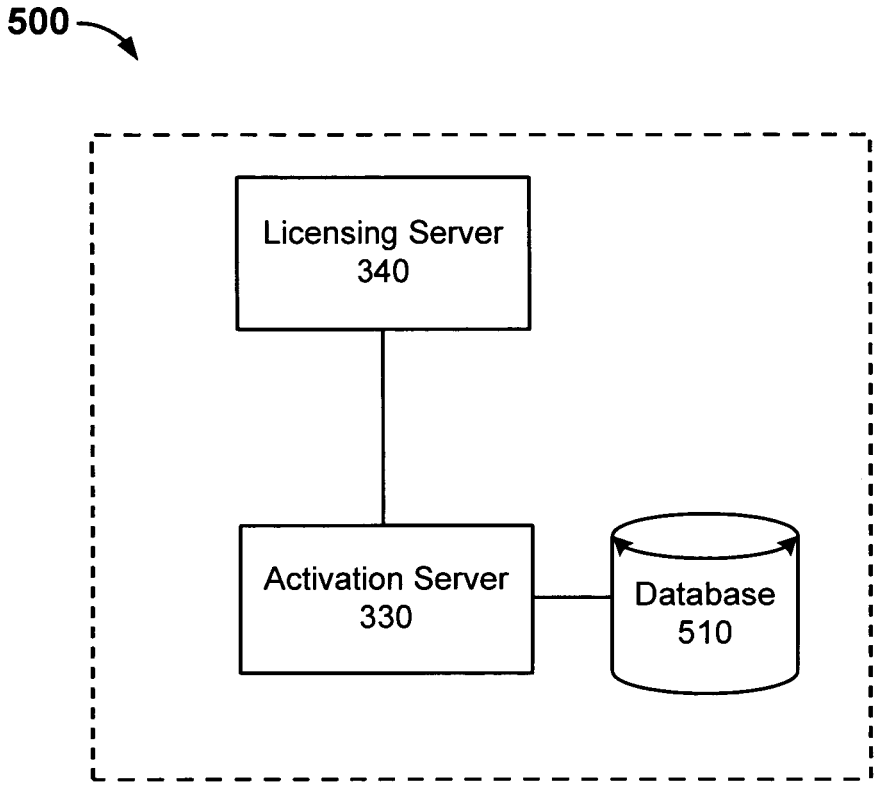

500
Licensing Server
340
Activation Server
330
Database
510

FIG. 5

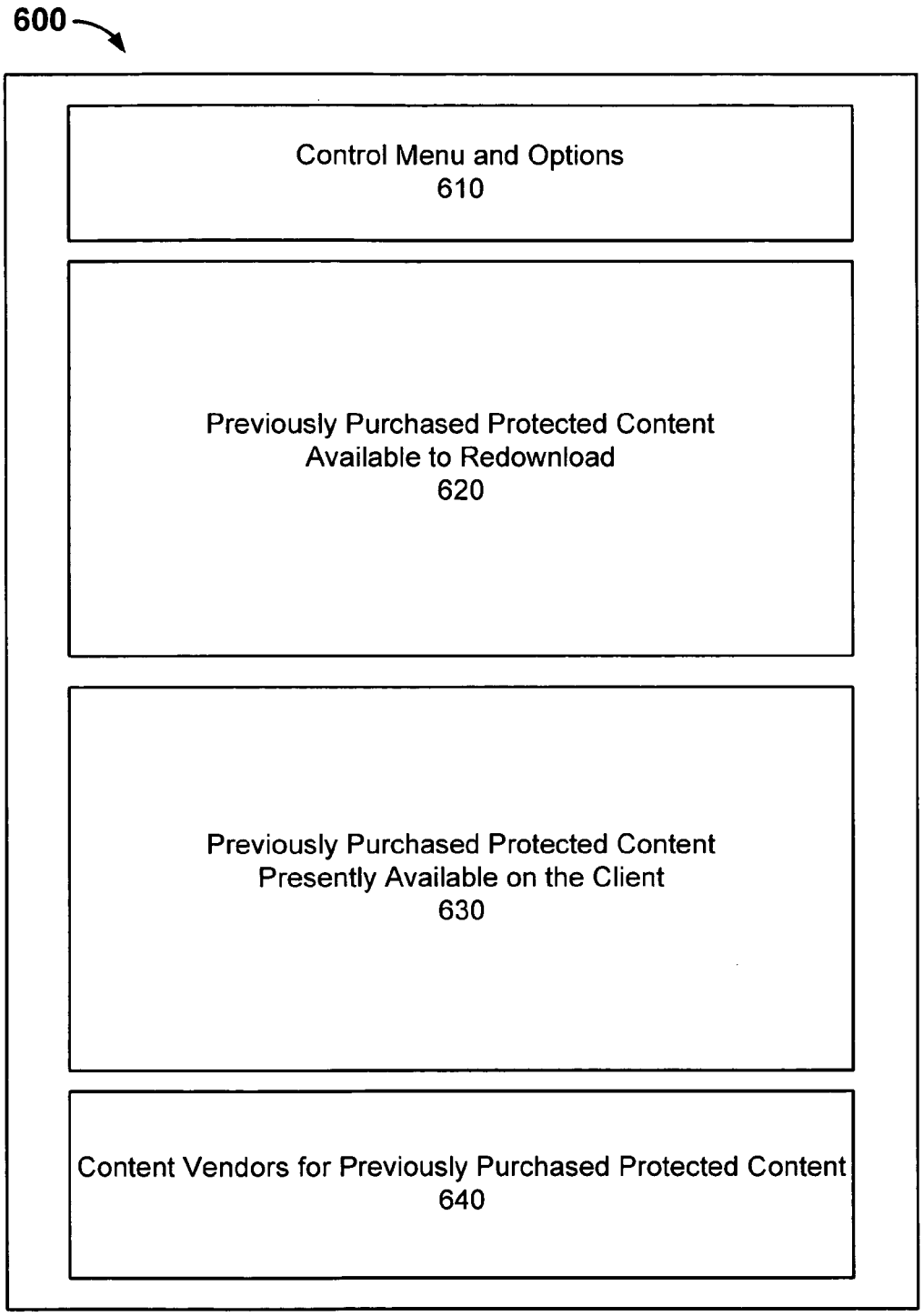

600
Control Menu and Options
610
Previously Purchased Protected Content
Available to Redownload
620
Previously Purchased Protected Content
Presently Available on the Client
630
Content Vendors for Previously Purchased Protected Content
640

FIG. 6

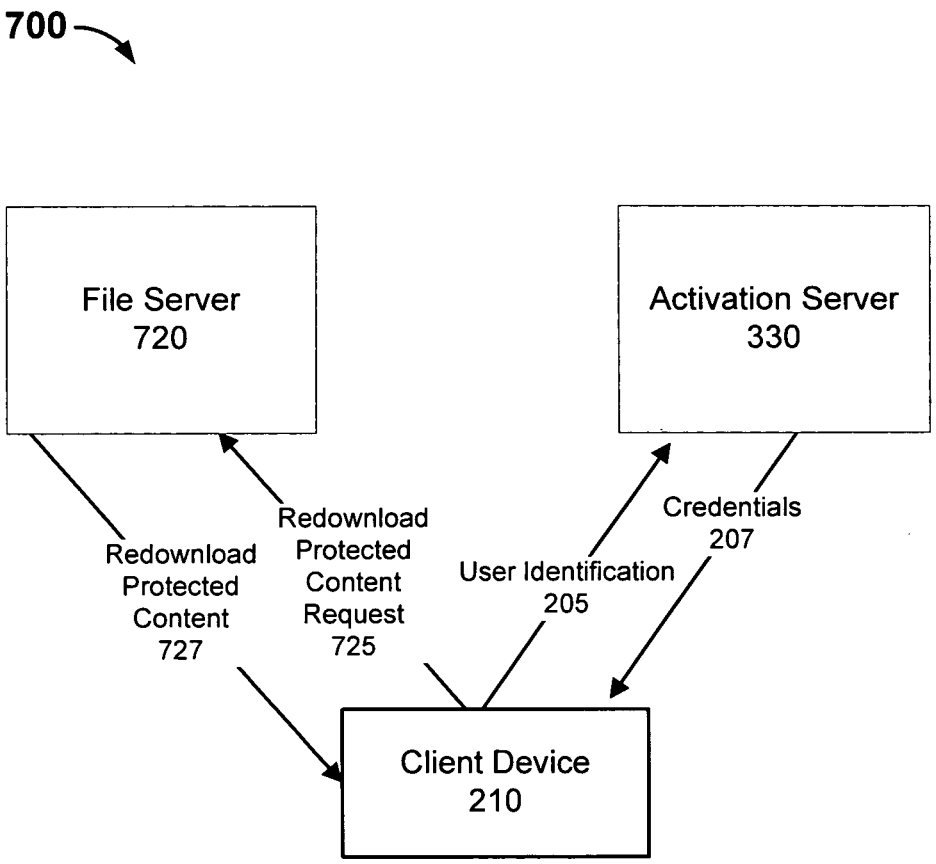

700
File Server
720
Activation Server
330
Redownload
Protected
Content
727
Redownload
Protected
Content
Request
725
User Identification
205
Credentials
207
Client Device
210

FIG. 7

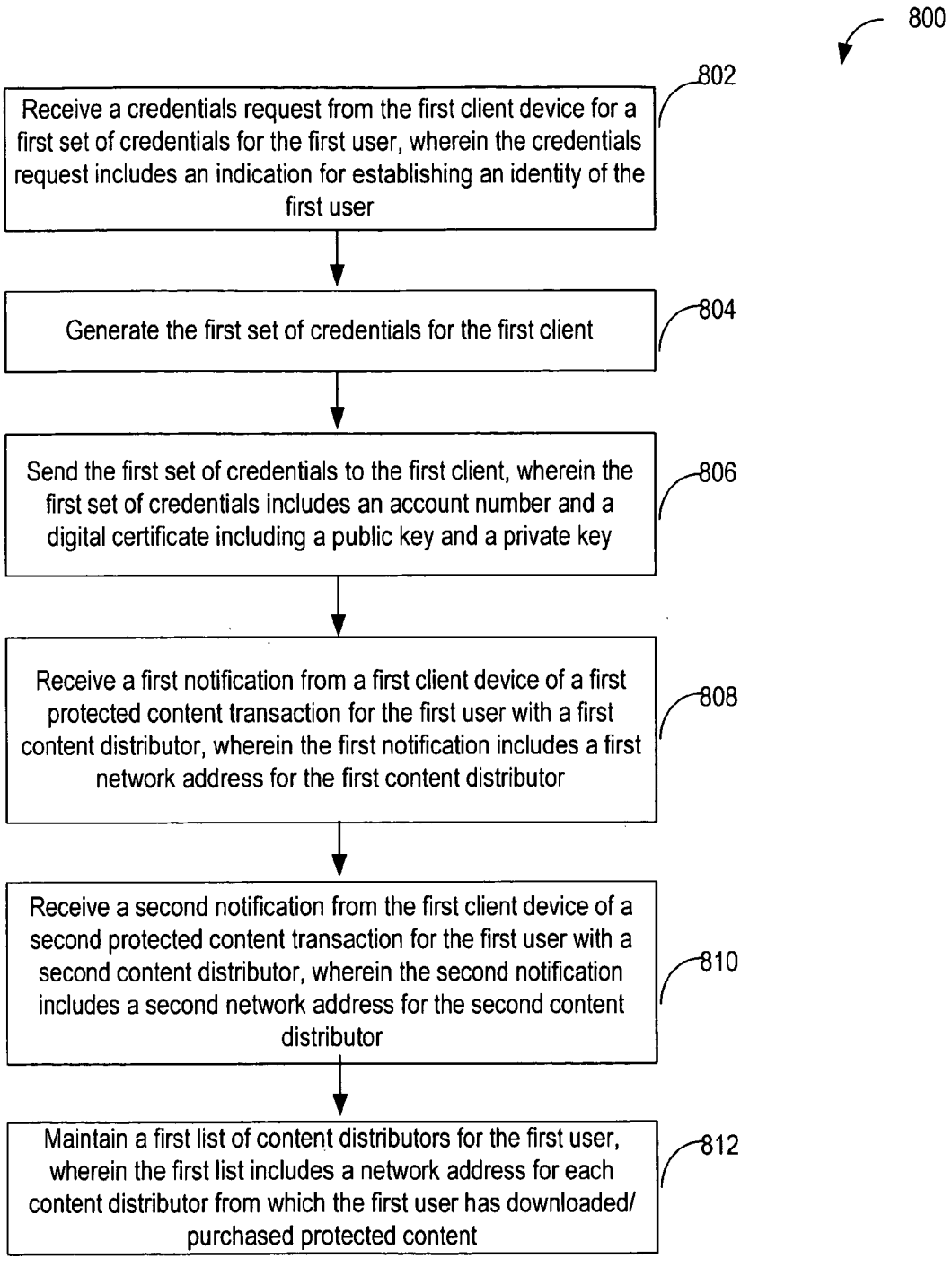

800
802
Receive a credentials request from the first client device for a first set of credentials for the first user, wherein the credentials request includes an indication for establishing an identity of the first user
804
Generate the first set of credentials for the first client
806
Send the first set of credentials to the first client, wherein the first set of credentials includes an account number and a digital certificate including a public key and a private key
808
Receive a first notification from a first client device of a first protected content transaction for the first user with a first content distributor, wherein the first notification includes a first network address for the first content distributor
810
Receive a second notification from the first client device of a second protected content transaction for the first user with a second content distributor, wherein the second notification includes a second network address for the second content distributor
812
Maintain a first list of content distributors for the first user, wherein the first list includes a network address for each content distributor from which the first user has downloaded/ purchased protected content

FIG. 8

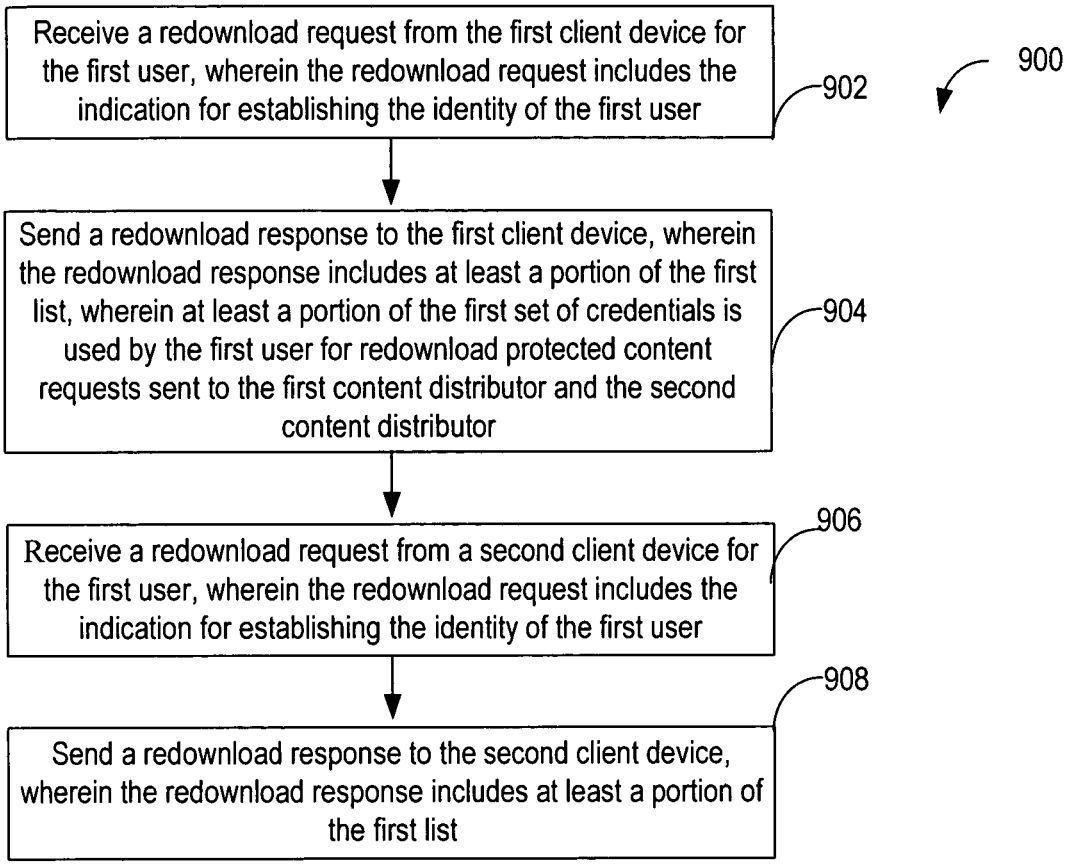

Receive a redownload request from the first client device for the first user, wherein the redownload request includes the indication for establishing the identity of the first user
902
900
Send a redownload response to the first client device, wherein the redownload response includes at least a portion of the first list, wherein at least a portion of the first set of credentials is used by the first user for redownload protected content requests sent to the first content distributor and the second content distributor
904
Receive a redownload request from a second client device for the first user, wherein the redownload request includes the indication for establishing the identity of the first user
906
Send a redownload response to the second client device, wherein the redownload response includes at least a portion of the first list
908

FIG. 9

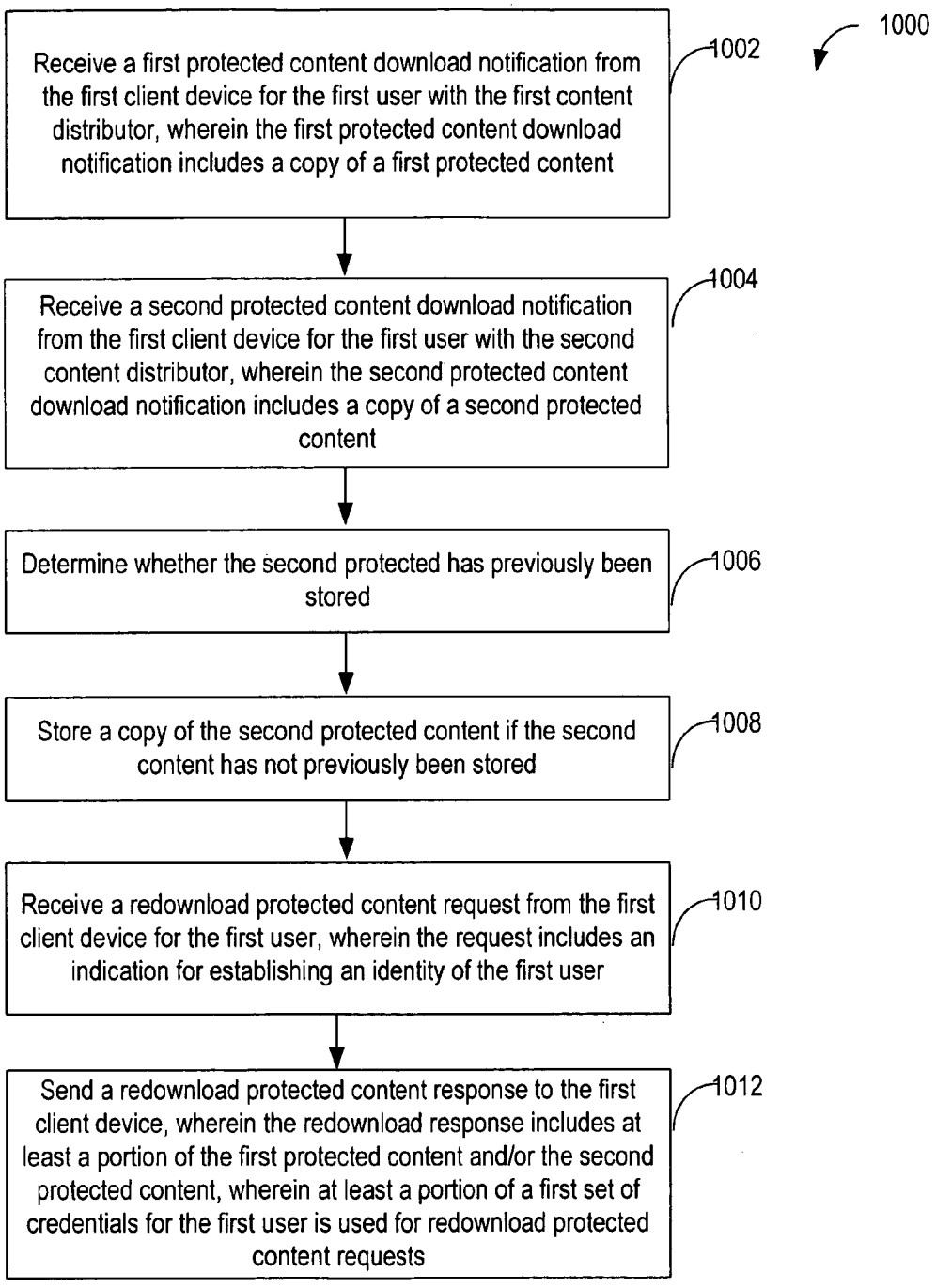

1000
Receive a first protected content download notification from the first client device for the first user with the first content distributor, wherein the first protected content download notification includes a copy of a first protected content
1002
Receive a second protected content download notification from the first client device for the first user with the second content distributor, wherein the second protected content download notification includes a copy of a second protected content
1004
Determine whether the second protected has previously been stored
1006
Store a copy of the second protected content if the second content has not previously been stored
1008
Receive a redownload protected content request from the first client device for the first user, wherein the request includes an indication for establishing an identity of the first user
1010
Send a redownload protected content response to the first client device, wherein the redownload response includes at least a portion of the first protected content and/or the second protected content, wherein at least a portion of a first set of credentials for the first user is used for redownload protected content requests
1012

FIG. 10

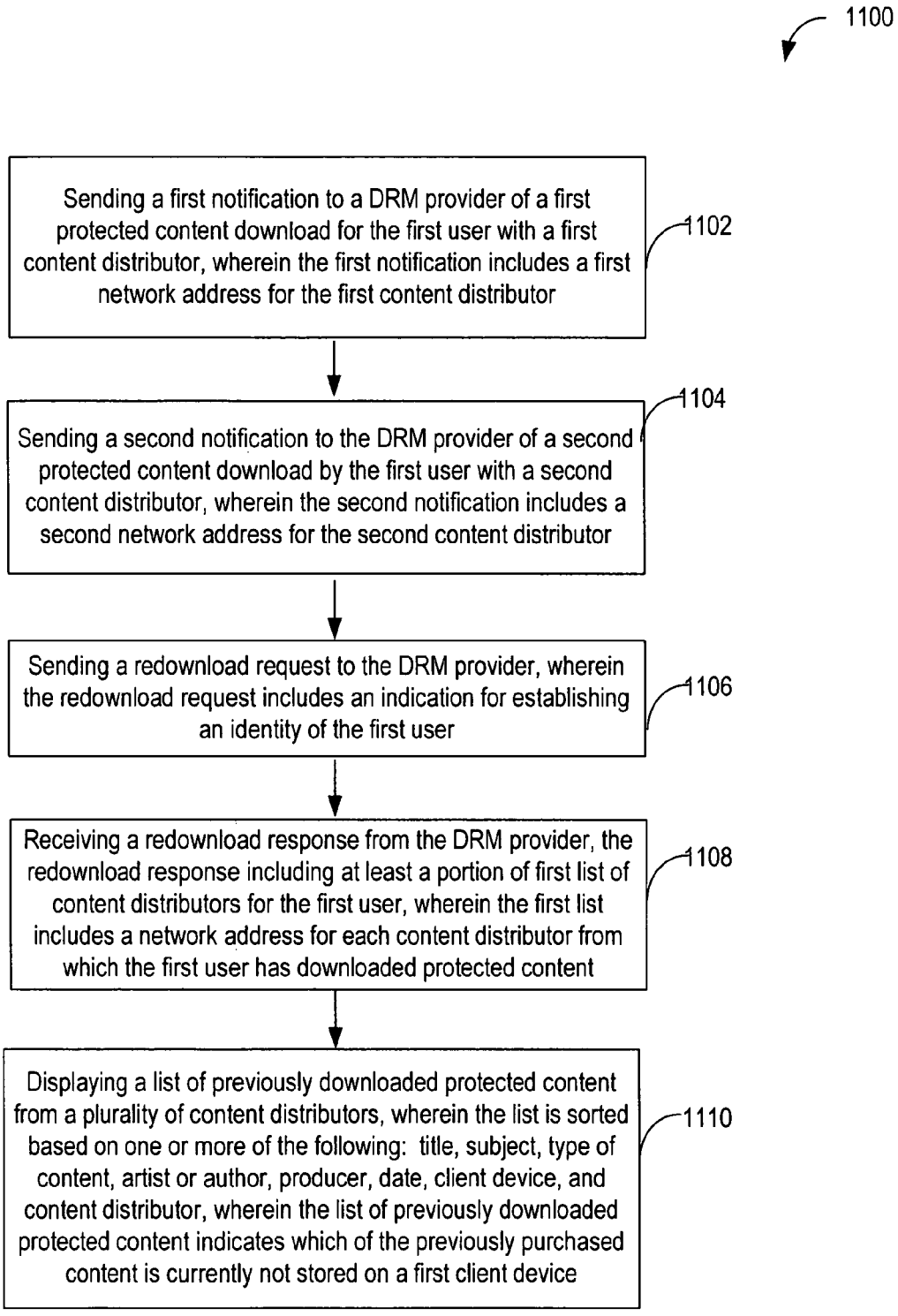

1100
Sending a first notification to a DRM provider of a first protected content download for the first user with a first content distributor, wherein the first notification includes a first network address for the first content distributor
1102
Sending a second notification to the DRM provider of a second protected content download by the first user with a second content distributor, wherein the second notification includes a second network address for the second content distributor
1104
Sending a redownload request to the DRM provider, wherein the redownload request includes an indication for establishing an identity of the first user
1106
Receiving a redownload response from the DRM provider, the redownload response including at least a portion of first list of content distributors for the first user, wherein the first list includes a network address for each content distributor from which the first user has downloaded protected content
1108
Displaying a list of previously downloaded protected content from a plurality of content distributors, wherein the list is sorted based on one or more of the following: title, subject, type of content, artist or author, producer, date, client device, and content distributor, wherein the list of previously downloaded protected content indicates which of the previously purchased content is currently not stored on a first client device
1110

FIG. 11

DIGITAL RIGHTS MANAGEMENT RETRIEVAL SYSTEM

BACKGROUND OF THE INVENTION

With networks such as the Internet and various mobile networks gaining increasing popularity, more and more digital media content can be downloaded by users from a wide array of digital media content sources. To protect intellectual property rights, content producers and/or distributors often employ various types/forms of digital rights management (DRM) schemes to protect their digital content (e.g., protected content). Typically, if a user downloads protected content, the user can also acquire a license that includes a key to unlock the protected content before the content becomes readable, viewable, playable and/or otherwise accessible.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments are disclosed in the following detailed description and the accompanying drawings.

FIG. **1** is a functional diagram illustrating a programmed computer system for executing a digital rights management retrieval system in accordance with some embodiments.

FIG. **2** is a functional diagram illustrating a digital rights management retrieval system in accordance with some embodiments.

FIG. **3** is another functional diagram illustrating a digital rights management retrieval system in accordance with some embodiments.

FIG. **4** is another functional diagram illustrating a digital rights management retrieval system in accordance with some embodiments.

FIG. **5** is a functional diagram illustrating a DRM provider for a digital rights management retrieval system in accordance with some embodiments.

FIG. **6** is a functional diagram of a client device display for a digital rights management retrieval system in accordance with some embodiments.

FIG. **7** is another functional diagram illustrating a DRM provider for a digital rights management retrieval system in accordance with some embodiments.

FIG. **8** is a flow chart for a digital rights management retrieval system in accordance with some embodiments.

FIG. **9** is another flow chart for a digital rights management retrieval system in accordance with some embodiments.

FIG. **10** is another flow chart for a digital rights management retrieval system in accordance with some embodiments.

FIG. **11** is another flow chart for a digital rights management retrieval system in accordance with some embodiments.

DETAILED DESCRIPTION

Various embodiments can be implemented in numerous ways, including as a process; an apparatus; a system; a composition of matter; a computer program product embodied on a computer readable storage medium; and/or a processor, such as a processor configured to execute instructions stored on and/or provided by a memory coupled to the processor. In this specification, these implementations, or any other form that the various approaches of the various embodiments disclosed herein may take, may be referred to as techniques. In general, the order of the steps of disclosed processes may be altered within the scope of the techniques. Unless stated otherwise, a component such as a processor or a memory described as being configured to perform a task may be implemented as a general component that is temporarily configured to perform the task at a given time or a specific component that is manufactured to perform the task. As used herein, the term 'processor' refers to one or more devices, circuits, and/or processing cores configured to process data, such as computer program instructions.

A detailed description of one or more embodiments is provided below along with accompanying figures that illustrate the principles of the techniques. The techniques are described in connection with such embodiments, but the techniques are not limited to any embodiment. The scope of the techniques is limited only by the claims and the techniques encompass numerous alternatives, modifications and equivalents. Numerous specific details are set forth in the following description in order to provide a thorough understanding of the techniques. These details are provided for the purpose of example and the techniques may be practiced according to the claims without some or all of these specific details. For the purpose of clarity, technical material that is known in the technical fields related to the techniques has not been described in detail so that the techniques are not unnecessarily obscured.

To protect intellectual property rights, content producers and/or distributors often employ various types/forms of digital rights management (DRM) schemes to protect their digital content (e.g., protected content). Typically, if a user downloads protected content, the user can also acquire a license that includes a key to unlock the protected content before the content becomes readable, viewable, playable, and/or otherwise accessible.

Digital rights management (DRM) schemes can typically be classified as either "distributed" or "centralized" schemes/solutions. For example, for distributed schemes, a DRM provider supplies a DRM solution to any of a number of content producers and/or distributors who can issue licenses to any number of users. In this example, the DRM provider has no involvement beyond the initial supplying of the DRM solution. For centralized schemes, the DRM provider can supply the DRM solution, as similarly discussed above with respect to distributed schemes, and can also serve as the sole content distributor and as the sole issuer of licenses to users.

Each approach provides benefits and disadvantages. For example, a centralized solution allows the DRM provider to have complete control over license and content distribution. However, this approach may have the disadvantage of discouraging other content producers or distributors from participating in the centralized scheme. Content producers and distributors may be more likely to participate in distributed solutions, but, as previously mentioned, such a solution may not allow the DRM provider to be involved beyond supplying the initial DRM solution.

Various embodiments described herein may comprise solutions that may provide for continuing involvement on the part of the DRM provider in the licensing process, and may also provide for the participation of any number of content distributors and/or content providers. In some embodiments, at least in part in response to receiving a license request from a user, a content distributor delivers an unsigned license to a DRM provider, and the DRM provider returns a signed license to the content distributor. The content distributor fulfills the user's license request by transmitting the signed license to the user's client device, and the user's client device reads or otherwise accesses a protected digital object according to permissions included in the license. In this manner, the DRM provider can be involved in each license grant, allowing an amount of continuing control over the licensing process, while allowing participation of any number of content distributors and/or content providers/producers.

Various DRM schemes can also facilitate the distribution of protected digital content (e.g., protected content includes any digital content that is protected using any form of DRM scheme, such as e-book, digital music, digital video, digital photograph, multimedia, documents, and any other digital content). For example, for distributed schemes, a DRM provider supplies a DRM solution to any of a number of content providers/producers and/or content distributors (e.g., protected content vendors) who can issue licenses to any number of users. Protected content vendors typically allow users to retrieve (e.g., redownload) previously purchased protected content (e.g., previously purchased and previously downloaded protected content). For example, a user will often purchase various protected content from a number of different protected content vendors. However, when the user needs to retrieve certain of their previously purchased content (e.g., to redownload to the same or another client device), the user is required to know which protected content vendor(s) from which the user purchased that previously purchased protected content, and the user is also required to know the user's account information for that protected content vendor(s) (e.g., vendor specific user account information), in which the user then must retrieve/redownload that previously purchased content through, for example, the web based vendor storefront for each of the protected content vendor(s) using their vendor specific user account information.

Accordingly, a digital rights management retrieval system is provided. For example, using various embodiments of the digital rights management retrieval system disclosed herein, the user can retrieve (e.g., redownload) their previously purchased content using a single set of credentials (e.g., centrally assigned user account information and a centrally assigned set of credentials for the user, in which it is assigned by, for example, a central DRM service/software solution provider, such as Adobe Systems Incorporated or any other entity). Moreover, the user is not required to know which protected content vendor(s) from which the user purchased their previously purchased protected content, and the user is not required to know or maintain any vendor specific user account information or vendor specific credentials. For example, the user can retrieve (e.g., redownload) their previously purchased content using a single set of credentials, in which the user can be authenticated with each of the protected content vendors using a centrally assigned private key and a digital certificate (e.g., a signed certificate, which is signed using the private key). In some embodiments, a digital rights management system includes receiving a first notification from a first client device of a first protected content transaction for a first user with a first content distributor, wherein the first notification includes a first network address for the first content distributor; receiving a second notification from the first client device of a second protected content transaction by the first user with a second content distributor, wherein the second notification includes a second network address for the second content distributor; and maintaining a first list of content distributors for the first user, wherein the first list includes a network address for each content distributor from which the first user has downloaded protected content. In some embodiments, the digital rights management retrieval system can be provided using a protected content software solution (e.g., Adobe® Digital Editions®) or any other solution that can support, for example, a distributed DRM system that provides for centralized user credentials that can be recognized by multiple protected content vendors.

FIG. **1** is a functional diagram illustrating a programmed computer system for executing a digital rights management retrieval system in accordance with some embodiments. As shown, FIG. **1** provides a functional diagram of a general purpose computer system programmed to provide a digital rights management retrieval system in accordance with some embodiments. As will be apparent, other computer system architectures and configurations can be used to perform digital rights management retrieval. Computer system **100**, which includes various subsystems as described below, includes at least one microprocessor subsystem (also referred to as a processor or a central processing unit (CPU)) **102**. For example, processor **102** can be implemented by a single-chip processor or by multiple processors. In some embodiments, processor **102** is a general purpose digital processor that controls the operation of the computer system **100**. Using instructions retrieved from memory **110**, the processor **102** controls the reception and manipulation of input data, and the output and display of data on output devices (e.g., display **118**). In some embodiments, processor **102** includes and/or is used to provide the functionality as shown in and described below with respect to FIGS. **2** through **7** (e.g., client device **210**, DRM provider **230**, activation server **330**, licensing server **340**, and/or system **500**) and/or executes/performs the processes described below with respect to FIGS. **8** through **11**.

Processor **102** is coupled bi-directionally with memory **110**, which can include a first primary storage, typically a random access memory (RAM), and a second primary storage area, typically a read-only memory (ROM). As is well known in the art, primary storage can be used as a general storage area and as scratch-pad memory, and can also be used to store input data and processed data. Primary storage can also store programming instructions and data, in the form of data objects and text objects, in addition to other data and instructions for processes operating on processor **102**. Also as well known in the art, primary storage typically includes basic operating instructions, program code, data and objects used by the processor **102** to perform its functions (e.g., programmed instructions). For example, primary storage devices **110** can include any suitable computer-readable storage media, described below, depending on whether, for example, data access needs to be bidirectional or uni-directional. For example, processor **102** can also directly and very rapidly retrieve and store frequently needed data in a cache memory (not shown).

A removable mass storage device **112** provides additional data storage capacity for the computer system **100**, and is coupled either bi-directionally (read/write) or uni-directionally (read only) to processor **102**. For example, storage **112** can also include computer-readable media such as magnetic tape, flash memory, PC-CARDS, portable mass storage devices, holographic storage devices, and other storage devices. A fixed mass storage **120** can also, for example, provide additional data storage capacity. The most common example of mass storage **120** is a hard disk drive. Mass storage **112**, **120** generally store additional programming instructions, data, and the like that typically are not in active use by the processor **102**. It will be appreciated that the information retained within mass storage **112**, **120** can be incorporated, if needed, in standard fashion as part of primary storage **110** (e.g., RAM) as virtual memory.

In addition to providing processor **102** access to storage subsystems, bus **114** can be used to provide access other subsystems and devices as well. As shown, these can include a display monitor **118**, a network interface **116**, a keyboard **104**, and a pointing device **106**, as well as an auxiliary input/output device interface, a sound card, speakers, and other subsystems as needed. For example, the pointing device **106**

can be a mouse, stylus, track ball, or tablet, and is useful for interacting with a graphical user interface.

The network interface **116** allows processor **102** to be coupled to another computer, computer network, or telecommunications network using a network connection as shown. For example, through the network interface **116**, the processor **102** can receive information (e.g., data objects or program instructions), from another network, or output information to another network in the course of performing method/process steps. Information, often represented as a sequence of instructions to be executed on a processor, can be received from and outputted to another network. An interface card or similar device and appropriate software implemented by (e.g., executed/performed on) processor **102** can be used to connect the computer system **100** to an external network and transfer data according to standard protocols. For example, various process embodiments disclosed herein can be executed on processor **102**, or can be performed across a network such as the Internet, intranet networks, or local area networks, in conjunction with a remote processor that shares a portion of the processing. Additional mass storage devices (not shown) can also be connected to processor **102** through network interface **116**.

An auxiliary I/O device interface (not shown) can be used in conjunction with computer system **100**. The auxiliary I/O device interface can include general and customized interfaces that allow the processor **102** to send and, more typically, receive data from other devices such as microphones, touch-sensitive displays, transducer card readers, tape readers, voice or handwriting recognizers, biometrics readers, cameras, portable mass storage devices, and other computers.

In addition, various embodiments disclosed herein further relate to computer storage products with a computer readable medium that includes program code for performing various computer-implemented operations. The computer-readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of computer-readable media include, but are not limited to, all the media mentioned above: magnetic media such as hard disks, floppy disks, and magnetic tape; optical media such as CD-ROM disks; magneto-optical media such as optical disks; and specially configured hardware devices such as application-specific integrated circuits (ASICs), programmable logic devices (PLDs), and ROM and RAM devices. Examples of program code include both machine code, as produced, for example, by a compiler, or files containing higher level code (e.g., script) that can be executed using an interpreter.

The computer system shown in FIG. **1** is but an example of a computer system suitable for use with the various embodiments disclosed herein. Other computer systems suitable for such use can include additional or fewer subsystems. In addition, bus **114** is illustrative of any interconnection scheme serving to link the subsystems. Other computer architectures having different configurations of subsystems can also be utilized.

FIG. **2** is a functional diagram illustrating a digital rights management retrieval system in accordance with some embodiments. As shown, a digital rights management retrieval system **200** includes a client device **210** in network communication (e.g., via the Internet, a cellular/mobile/wireless network or any other network) with a DRM provider **230**. Also, the client device **210** is in communication (e.g., network communication, such as via the Internet, a cellular/mobile/wireless network or any other network) with a content distributor (e.g., protected content vendor A) **250** and a content distributor (e.g., protected content vendor B) **260**, and the client device can request/purchase protected content from the content distributors **250** and **260**. In some embodiments, the client device **210** is in network communication with more than two content distributors from which the client device **210** can request/purchase protected content.

In some embodiments, the client device **210** is a computer system that executes the client software for the digital rights management retrieval system **200** (e.g., programmed processor **102** and/or programmed computer system **100**, or any other computing device, such as a mobile phone, smart phone, PDA, netbook, laptop, computer desktop, entertainment/gaming device, music player device, personal navigation device, and/or video player device). In some embodiments, the content distributors **250** and/or **260** include a web server, on which is stored, for example, protected content available for purchase and/or download by users. For example, the client device **210** can download protected content from content distributor **250** and/or **260**.

In some embodiments, the protected content is encrypted and/or otherwise protected, such that the client device **210** can read or otherwise access the protected digital object only through the use of a license obtained from the content distributor. In some embodiments, the DRM provider **230** supplies a protected content reader application to the client device **210** (as shown in and discussed below with respect to FIG. **3**). For example, the reader application determines whether an appropriate license has been obtained before allowing the user to view or otherwise utilize the protected content.

FIG. **3** is another functional diagram illustrating a digital rights management retrieval system in accordance with some embodiments. As shown, a digital rights management (DRM) retrieval system **300** includes a client device **210** in communication (e.g., network communication) with an activation server **330**. The client device **210** sends a credentials request **305** to the activation server **330**. The credentials request **305** is a request for a first set of credentials for a first user of the client device **210**. In some embodiments, the credentials request **305** includes an indication for establishing an identity of the first user. In some embodiments, the credentials request **305** includes one or more of the following for establishing an identity of the first user: a user ID and password, a biometric indication, a smart card, and a digitally signed statement issued by a trusted third party (e.g., a SAML token). In some embodiments, the activation server **330** verifies the credentials request (e.g., verifying that the provided indication properly establishes the identity of the first user). In some embodiments, the activation server **330** generates the first set of credentials. As shown, the activation server **330** sends the first set of credentials **307** to the client device **210**. In some embodiments, the first set of credentials includes an account number and a digital certificate, and, in some embodiments, the digital certificate includes a public key/private key pair.

For example, instead of the user navigating to and through various vendor storefronts using various vendor-specific credentials for the user, the user can use the first set of credentials **307**, which is centrally assigned, as similarly discussed above. In some embodiments, the first set of credentials includes a digital certificate and a public/private key pair, which are generated by a central activation server, such as the activation server **330**. For example, the client device **210** can use the digital private key and the digital certificate to authenticate itself with various content distributors (e.g., using a signed digital certificate). In some embodiments, a content distributor can also be a content provider.

As shown in FIG. **3**, the client device **210** is also in communication (e.g., network communication) with a content

distributor (Vendor A) **250** and another content distributor (Vendor B) **260**. For example, the client device **210** can download (e.g., purchase through an electronic transaction and download) protected content from various content distributors, such as the content distributors **250** and **260**. In some embodiments, the client device **210** uses at least a portion of the first set of credentials for the first user for performing a plurality of protected content download transactions with various content distributors. In some embodiments, the content distributors **250** and **260** each have web based stores (e.g., web site based stores for protected content download/purchase transactions) that require users to log in to authenticate the users for access to protected content for purchase/download to the users' respective, activated client devices. As shown, the first user of the client device **210** logs into the protected content web site of the content distributor **250** by providing the first user's account number and signed digital certificate **355**. In some embodiments, other information is provided for logging into the protected content web site of the content distributor **250**, including, for example, at least a portion of the first set of credentials. Protected content selected/purchased for download can then be downloaded as shown at **357**. Similarly, the client device **210** is logged into the protected content web site of the content distributor **260** by providing the first user's account number and signed digital certificate **365**, and protected content selected/purchased for download can then be downloaded as shown at **367**.

In some embodiments, for each protected content transaction and/or each protected content transaction with a new content distributor (e.g., content distributors **250** and **260**), the client device **210** sends a notification of protected content transaction(s) **325** to the activation server **330**. In some embodiments, the notification of protected content transaction(s) **325** includes a network address for the content distributor for such protected content transaction(s). In some embodiments, the activation server **330** maintains a first list of content distributors for the first user, in which the first list includes a network address (e.g., a uniform resource locator (URL)) for each content distributor from which the first user has downloaded/purchased protected content (e.g., associated with the first user's account number). In some embodiments, the activation server **330** maintains such lists for each user's downloaded/purchased protected content activities.

In some embodiments, during (and/or after) protected content fulfillment (e.g., a request to download protected content) with a new protected content distributor, the client device **210** (e.g., content management software executed on/performed by the client device) communicates with the activation server **330** (e.g., a centralized activation/DRM server) to report a new protected content distributor from which protected content is being downloaded/purchased. In some embodiments, the activation server **330** includes and/or is in communication with, for example, a database that maintains lists for each user's downloaded/purchased protected content activities, as discussed below with respect to FIG. **5**.

As shown in FIG. **3**, a licensing server **340** is communication (e.g., network communication) with the content distributors **250** and **260**. For example, when the client device **210** selects/purchases for download protected content from the content distributor **250**, the content distributor **250** sends an unsigned license **342** for that digital content to the licensing server **340**. The licensing server **340** sends a signed license **344** to the content distributor **250**. Similarly, when the client device **210** selects/purchases for download protected content from the content distributor **260**, the content distributor **260** sends an unsigned license **346** for that digital content to the licensing server **340**, and the licensing server **340** sends a signed license **348** to the content distributor **260**.

In some embodiments, content distributors **250** and/or **260** maintain copies of these signed licenses for the first user of the client device **210** (e.g., the licensing server signing may include a transactional fee that is charged to the content distributors, which creates an incentive for the content distributors to archive copies of such signed licenses for retrieval if needed, such as for redownload requests, as discussed herein). In some embodiments, the DRM provider **230** includes the activation server **330** and the licensing server **340**. In some embodiments, the activation server **330** and the licensing server **340** are implemented on a single server or a plurality of servers.

As used herein, the term "license" is meant to include any information pertaining to the rights that can govern the use of any digital content (e.g., which can be protected, such as encrypted, to provide protected content). In some embodiments, a license includes a key used to unlock protected digital content. For example, a license can include a key that can be used to decrypt encrypted digital content. In some embodiments, a license includes information identifying the digital content, information identifying a user, and/or information pertaining to permissions to be granted to the user. In some embodiments, information identifying the digital content can include a code associated with the digital content by the content distributor **250** or **260** so that the DRM provider (e.g., the DRM provider that facilitates the licensing server **340**) is not able to determine which digital content is being accessed by the user. For example, if the digital content is an electronic book, an alphanumeric code can be assigned to the book and used to identify the book in the license transmitted to the DRM provider. The DRM provider for this embodiment is not aware of the association between the assigned code and the title of the electronic book, and therefore the DRM provider is not able to determine the title of the book being requested by the user.

In some embodiments, the licensing server **340** applies a digital signature to the unsigned license. For example, a digital signature can allow a reader application, executed on the client device **210**, to authenticate the source of the signed license. As used herein, the term "digital signature" is meant to include any element of a document (e.g., the digital content is stored in a document) that can provide for authentication of the document. In some embodiments, a digital signature includes cryptographic elements. In some embodiments, a digital signature includes a string of text identifying the DRM provider. For example, a hash function can be applied to the document to generate a document fingerprint. The fingerprint can be encrypted using a private key to generate a signed fingerprint (e.g., a private key held by the DRM provider). The digital signature element can include the signed fingerprint and a public key corresponding to the private key. In some embodiments, the digital signature object is embedded inside the document. In some embodiments, the client device **210** calculates the fingerprint and compares the calculated fingerprint with results obtained by decrypting the signed fingerprint using the public key. If the calculated fingerprint matches the original fingerprint obtained by decrypting the signed fingerprint with the public key, the document can be considered to be authenticated. Of course, this is merely one example of a digital signature and authentication technique, and as will be appreciated, various other authentication techniques can also be used. As will also be appreciated, a variety of digital signature techniques can be used, such as Full Domain Hash or RSA-PSS (RSA Probabilistic Signature Scheme). Accordingly, various embodiments include any of a

wide range of possible digital signature techniques. In some embodiments, the term "signed license" refers to an electronic license document to which a digital signature has been applied, and the term "unsigned license" refers to an electronic license document to which a digital signature has not been applied.

"Digital content" as referred to herein relates to information that is organized and/or formatted in a digitized form. For example, digital content can include one or more documents, visual media and/or audio media, and/or combinations thereof. Examples of digital content include video (e.g., movies, television shows, or any other type of video content), photographs, multimedia, music, electronic books (ebooks), and electronic documents. As will be appreciated, these are merely examples of the types of information that can be maintained as digital content. For example, digital content can be maintained in a compressed format to enable efficient storage of the digital content in a storage medium and/or transmission of the digital content in a communication network. In some embodiments, digital content is protected. For example, digital content can be encrypted in an effort to prevent unauthorized use. As described above, protected content can be read or otherwise accessed through the use of a key that can be included in a license. For example, a key can allow for the decryption of encrypted digital content. Digital content can be distributed via disc or other media, or can be distributed via a network, such as the Internet or a cellular network.

In some embodiments, the client device **210** includes a desktop computer system, In some embodiments, the client device **210** includes a notebook computer, a personal digital assistant (PDA), a cellular/mobile phone, a portable music player, an entertainment/game console, a personal navigation device, and/or any other computing device.

In some embodiments, the DRM provider provides a reader application **345** that is executed on/performed by the client device **210**. For example, the reader application **345** can include instructions stored in a storage medium (e.g., a computer readable storage medium) that, if executed, enable user computing platform **210** to view or otherwise access digital content, such as protected content on an activated client device **210** for that protected content. For example, the reader application **345** can include an electronic book viewer. As another example, the reader application **345** can include a video and/or audio player that can be used, for example, to watch movies or to listen to music (e.g., or any other video/audio content). As will be apparent, various other reader applications can be used.

In some embodiments, the reader application **345** is downloaded from a website hosted by the DRM provider (e.g., DRM provider **230**), and the DRM provider maintains records of users and/or the user's client devices **210** that have received copies of the reader application. In some embodiments, the reader application **345** checks licenses to ensure authenticity before allowing the client device **210** to access protected content.

For an example of a series of transactions demonstrating the DRM retrieval system **300**, consider the following, as a user begins the process by downloading protected content **357** from the content distributor **250**, as discussed above. For this example, the downloaded protected content is assumed to be an ebook. Without a license, the reader application **345** does not allow the user to view the ebook. Therefore, the user transmits a license request to the content distributor **250**, and the license request is received by content distributor **250**. At least in part in response to receiving the license request, content distributor **250** provides a license, for example, as discussed above. In some embodiments, the generated license includes a code identifying the title of the electronic book, information identifying the content distributor, and a listing of permissions to be granted to the client device **210** and/or to the user. The license can also include a key that can be utilized to unlock the protected digital object. For example, the key can allow the client device **210** to decrypt an encrypted digital object. In some embodiments, the license includes a text file written in an Extensible Markup Language (XML) format or any other format. As discussed above, the content distributor **250** transmits the generated, but as yet unsigned, license **342** to the licensing server **340**. The licensing server **340** inspects the contents of license **342**, and applies a digital signature to the license, thereby creating a signed license **344**. In some embodiments, the licensing server **340** transmits the signed license **344** to the content distributor **250**, and the content distributor **250** transmits the signed license to the client device **210**. In some embodiments, the reader application **345** inspects the digital signature to ensure the license's authenticity and allows the user to view the ebook via a display device for the client device **210** if the license is determined to be authentic. In some embodiments, the reader application **345** utilizes a key included in the license to unlock the protected content. Also, in some embodiments, the protected content can be transferred to a second client device (not shown) for viewing by the user, and, in some embodiments, the second client device is also required to be activated, as similarly discussed herein.

In some embodiments, the activation server **330** generates an activation record for each client device. For example, the activation server receives an activation request from the client device **210**, generates an activation record for the client device **210**, and sends the activation record to the client device **210**. In some embodiments, the activation record includes at least in part information that is unique to the client device **210** (e.g., a fingerprint, based on hardware and/or software platform information unique to the client device). In some embodiments, the reader application **345** verifies that the client device **210** has a valid activation record for that device prior to providing access to various protected content.

In some embodiments, the first set of credentials is transferred from the client device **210** to another client device. For example, the first set of credentials can be transferred using a USB memory device or using any other storage and/or network transfer technique.

In some embodiments, an activation limit is used to restrict the maximum number of devices that can be activated for a user's account with a DRM provider. In some embodiments, a maximum number of client devices can be activated for the user account for purchased content from a first vendor based on a first vendor license restriction limit and/or based on a general device activation limit for any protected content. For example, when the activation server **330** receives an activation request for a new client device for the first user, the activation server **330** determines whether an activation limit has been exceeded for the first user. If the activation limit has not been exceeded for the first user, then the activation server **330** sends an activation record to the new client device. In some embodiments, as discussed above, the new activation record is uniquely associated with the new client device.

FIG. **4** is another functional diagram illustrating a digital rights management retrieval system in accordance with some embodiments. As shown, a digital rights management retrieval system **400** facilitates a retrieval of previously downloaded/purchased content. In some embodiments, the client device **210** (e.g., content management software executed on/performed by the client device) communicates with any

protected content distributor (e.g., the content distributor **250** and/or **260**), authenticates itself as described above, and requests a list of resources licensed to that user (e.g., licenses to these resources and the actual content). As shown, when a previously purchased content redownload is desired/required, the client device **210** (e.g., content management software executed on/performed by the client device) sends a redownload request **425** to the activation server **330** (e.g., a centralized DRM server), and receives a redownload response **427** (e.g., including at least in part the list of previously downloaded/purchased content distributor URLs). In some embodiments, the client device **210** displays the list of content distributors from which previously downloaded/content was purchased. As also shown, the client device sends a redownload protected content request **455** to the content distributor **250**, and retrieves the list of resources **457** from the content distributor **250**. Similarly, the client device sends a redownload protected content request **465** to the content distributor **260**, and retrieves the list of resources **467** from the content distributor **260**. In some embodiments, the client device **210** displays the list of resources from each of the content distributors from which previously downloaded/content was purchased, as discussed below with respect to FIG. **6**. For example, based on the list of resources from each of the content distributors, various previously purchased/downloaded protected content can be redownloaded to the client device **210**. Accordingly, licenses and previously purchased content can be retrieved/redownloaded for selected (or for all) resources. In some embodiments, licenses can be created, signed, and stored in a data store (e.g. a database) maintained at/by the content distributor (e.g., content distributor **250** or **260**), such as during an initial protected content download, which reduces a number of requests for licenses to the licensing server **340**.

As shown in FIG. **4**, the digital rights management (DRM) retrieval system **400** also includes a content provider **410** and a content provider **420**. For example, the content provider **410** and/or **420** can produce ebooks or any other digital content, such as movies, music, television shows, photographs, multimedia content, and/or electronic documents. As shown, in some embodiments, the content provider **410** provides digital content **415** to the content distributor **260**. In some embodiments, the content provider **410** supplies digital content **415** to any number of content distributors. Also, in some embodiments, the content distributor **260** and the content provider **410** includes the same entity. That is, a single entity can serve as both a content provider and a content distributor. Similarly, in some embodiments, the content provider **420** provides digital content **425** to the content distributor **250**.

In some embodiments, a second client device that has been activated for the first user can send a redownload request, in which the redownload request includes the indication for establishing the identity of the first user. The activation server sends a redownload response to the second client device, in which the redownload response includes at least a portion of a list for the first user, as discussed above. The second client device can then send redownload protected content requests to various content distributors included on the list. For example, at least a portion of the first set of credentials can be used by the first user for redownload protected content requests sent to the first content distributor and to the second content distributor.

FIG. **5** is a functional diagram illustrating a DRM provider for a digital rights management retrieval system in accordance with some embodiments. As shown, a DRM provider **500** includes the activation server **330** in communication (e.g., network communication with the licensing server **340**. In some embodiments, the activation server **330** and the licensing server **340** are implemented on a single server or a plurality of servers. As also shown, the activation server **330** includes and/or is in communication (e.g., network communication) with a database **510**. In some embodiments, the database **510** stores a first list of content distributors for the first user, in which the first list includes a network address (e.g., URL) for each content distributor from which the first user has downloaded/purchased protected content. In some embodiments, the database **510** stores such lists for each user's downloaded/purchased protected content activities.

FIG. **6** is a functional diagram of a client device display for a digital rights management retrieval system in accordance with some embodiments. As shown, a client device display **600** for a digital rights management retrieval system includes, for example, a set of graphical user interface (GUI) display sub-/windows and/or menus **610**, **620**, **630**, and **640**. For example, a control menu and options sub-window **610** is provided. As discussed above, previously purchased protected content available to redownload and/or to download to a new client device is provided in a sub-/window **620**. Previously purchased protected content that is already stored on the client device/available on the client device is provided in a sub-/window **630**. In some embodiments, as discussed above, a list of content distributors/providers (e.g., content vendors) from which protected content was previously purchased is provided in a sub-/window **640**. In some embodiments, a list of previously downloaded protected content from a plurality of content distributors (available to redownload **620** and/or available on the client **630**) is sorted based on one or more of the following: title, subject, type of content, artist or author, producer, date, client device, and content distributor (e.g., using the control menu and options **610**). In some embodiments, the client device display **600** presents these windows and/or content in a manner that is formatted/modified based on one or more of the following: screen, interface, keyboard, and network bandwidth. For example, the client device display **600** can present these windows and/or content by implementing on one or more of the following: image(s) removal, format changes, and down sampling.

FIG. **7** is another functional diagram illustrating a DRM provider for a digital rights management retrieval system in accordance with some embodiments. As shown, a DRM provider **700** for a digital rights management retrieval system includes a file server **720** in communication (e.g., network communication) with the client device **210**. In some embodiments, protected content is uploaded from the client device **210** (and/or another protected content source) to the file server **720**. In some embodiments, the file server **720** receives a protected content download notification from each client device for each user with each content distributor, in which the protected content download notification includes a copy of the protected content. In this manner, the DRM provider provides a centralized data store of the previously downloaded/protected content for each of the users of the digital rights management retrieval system.

Referring to FIG. **7**, the file server **720** receives a redownload protected content request **725** from the client device **210** for the first user. In some embodiments, the redownload protected content request **725** includes an indication for establishing an identity of the first user, as similarly discussed above. The file server **720** sends a redownload protected content response **727** to the client device **210**. In some embodiments, the redownload protected content response **727** includes at least a portion of the previously downloaded/protected content for the first user.

In some embodiments, the file server **720** determines whether requests to store protected content are for identical protected content already stored by the file server **720** to avoid storage of duplicated protected content (or portions thereof). For example, a common encrypted payload can be determined by disregarding a unique license portion of the stored purchased content, thereby avoiding the storage of duplicate copies of the common encrypted by the file server **720**. Instead, a reference, or using any other technique, can be used to allow for only a single instance/copy of the common encrypted payload to be stored by the file server **720**. Accordingly, common protected content, which may be for different users, can be more efficiently stored by the file server **720**.

FIG. **8** is a flow chart for a digital rights management retrieval system in accordance with some embodiments. In some embodiments, one or more of the stages described below is implemented as executable instructions performed using a processor **102** and/or computer system **100** (e.g., executed by DRM provider **230** and/or activation server **330**). At stage **802**, a credentials request is received from the first client device for a first set of credentials for the first user. In some embodiments, the credentials request includes an indication for establishing an identity of the first user. At stage **804**, the first set of credentials for the first client is generated. At stage **806**, the first set of credentials is sent to the first client. In some embodiments, the first set of credentials includes an account number and a digital certificate including a public key and a private key. At stage **808**, a first notification is received from a first client device of a first protected content transaction for the first user with a first content distributor. In some embodiments, the first notification includes a first network address for the first content distributor. At stage **810**, a second notification is received from the first client device of a second protected content transaction for the first user with a second content distributor. In some embodiments, the second notification includes a second network address for the second content distributor. At stage **812**, a first list of content distributors for the first user is maintained. In some embodiments, the first list includes a network address for each content distributor from which the first user has downloaded/purchased protected content.

FIG. **9** is another flow chart for a digital rights management retrieval system in accordance with some embodiments. In some embodiments, one or more of the stages described below is implemented as executable instructions performed using a processor **102** and/or computer system **100** (e.g., executed by DRM provider **230** and/or activation server **330**). At stage **902**, a redownload request is received from the first client device for the first user. In some embodiments, the redownload request includes the indication for establishing the identity of the first user. At stage **904**, a redownload response is sent to the first client device. In some embodiments, the redownload response includes at least a portion of the first list, as similarly discussed above. In some embodiments, at least a portion of the first set of credentials is used by the first user for redownload protected content requests sent to the first content distributor and the second content distributor. At stage **906**, a redownload request is received from a second client device for the first user. In some embodiments, the redownload request includes the indication for establishing the identity of the first user. At stage **908**, a redownload response is sent to the second client device. In some embodiments, the redownload response includes at least a portion of the first list, as similarly discussed above.

FIG. **10** is another flow chart for a digital rights management retrieval system in accordance with some embodiments. In some embodiments, one or more of the stages described below is implemented as executable instructions performed using a processor **102** and/or computer system **100** (e.g., executed by system **700**). At stage **1002**, a first protected content download notification is received from the first client device for the first user with the first content distributor. In some embodiments, the first protected content download notification includes a copy of a first protected content. In some embodiments, the first protected content download notification includes a copy of an encrypted portion of the first protected content and a copy of a license portion of the first protected content that can be stored separately. At stage **1004**, a second protected content download notification is received from the first client device for the first user with the second content distributor. In some embodiments, the second protected content download notification includes a copy of a second protected content. In some embodiments, the second protected content download notification includes a copy of an encrypted portion of the second protected content and a copy of a license portion of the second protected content that can be stored separately. At stage **1006**, whether the second protected has previously been stored is determined. In some embodiments, determining whether the second protected has previously been stored includes determining whether the encrypted portion of the second protected has previously been stored (e.g., by comparing the encrypted portion of the second protected content with any previously stored encrypted portions of other content, such as the encrypted portion of the first protected content). At stage **1008**, a copy of the encrypted portion of the second protected content is stored if the encrypted portion of the second content has not previously been stored. At stage **1010**, a redownload protected content request is received from the first client device for the first user. In some embodiments, the request includes an indication for establishing an identity of the first user. At stage **1012**, a redownload protected content response is sent to the first client device. In some embodiments, the redownload response includes at least a portion of the first protected content and/or the second protected content. In some embodiments, at least a portion of a first set of credentials for the first user is used for redownload protected content requests.

FIG. **11** is another flow chart for a digital rights management retrieval system in accordance with some embodiments. In some embodiments, one or more of the stages described below is implemented as executable instructions performed using a processor **102** and/or computer system **100** (e.g., executed by client device **210**). At stage **1102**, a first notification is sent to a DRM provider of a first protected content download for the first user with a first content distributor. In some embodiments, the first notification includes a first network address for the first content distributor. At stage **1104**, a second notification is sent to the DRM provider of a second protected content download by the first user with a second content distributor. In some embodiments, the second notification includes a second network address for the second content distributor. At stage **1106**, a redownload request is sent to the DRM provider. In some embodiments, the redownload request includes an indication for establishing an identity of the first user. At stage **1108**, a redownload response is received from the DRM provider, the redownload response including at least a portion of first list of content distributors for the first user. In some embodiments, the first list includes a network address for each content distributor from which the first user has downloaded protected content. At stage **1110**, a list of previously downloaded protected content from a plurality of content distributors is displayed. In some embodiments, the list is sorted based on one or more of the following: title, subject, type of content, artist or author, producer, date,

client device, and content distributor. In some embodiments, the list of previously downloaded protected content indicates which of the previously purchased content is currently not stored on a first client device.

Although the foregoing embodiments have been described in some detail for purposes of clarity of understanding, the techniques are not limited to the details provided. There are many alternative ways of implementing the techniques. The disclosed embodiments are illustrative and not restrictive.

What is claimed is:

1. A method comprising:

digitally signing, by a digital rights management system, a certificate with a private key in response to receiving a credentials request for a user from a client device via a data network, wherein the signed certificate is usable by the client device for authentication with multiple unaffiliated content distributors;

transmitting, by the digital rights management system, the signed certificate and a public key to the client device via the data network, wherein the public key corresponds to the private key;

receiving, by the digital rights management system, an unsigned license for digital content from a content distributor that has authenticated the client device using the signed certificate;

digitally signing, by the digital rights management system, the license by using the private key to encrypt a portion of the license, wherein the encrypted portion is decryptable by the client device using the public key provided to the client device with the signed certificate; and

transmitting, by the digital rights management system, the signed license to the content distributor, wherein the signed license authorizes use of the digital content by the client device.

2. The method of claim **1**, further comprising transmitting an account number with the signed certificate and the public key, wherein the account number is usable for authenticating the user with the unaffiliated content distributors.

3. The method of claim **1**, wherein the unsigned license comprises code for identifying the digital content at the content distributor, wherein the first code and the second code cannot be used by the digital rights management system for identifying the digital content.

4. The method of claim **1**, further comprising transmitting, by the digital rights management system, a digital media application for accessing the digital content to the client device and maintaining a record associating the transmitted digital media application and the signed certificate with the user.

5. The method of claim **1**, further comprising, subsequent to transmitting the signed certificate to the client device:

receiving, by the digital rights management system, a notification from the client device of a protected content transaction for the user with the content distributor, wherein the notification is associated with downloading the digital content from the content distributor and includes a first network address for the content distributor;

receiving, by the digital rights management system, an additional notification from the client device of an additional protected content transaction for the user with an additional content distributor, wherein the additional notification is associated with downloading additional digital content from the additional content distributor and includes an additional network address for the additional content distributor; and

maintaining, by the digital rights management system, a list of content distributors for the user using the notifications and the additional notification received from the client device, wherein the list of content distributors includes the network address and the additional network address.

6. The method of claim **5**, wherein the network address for the content distributor and the additional network address for the additional content distributor comprises respective uniform resource locators for the content distributor and the content distributor.

7. The method of claim **5**, further comprising:

receiving, by the digital rights management system, a redownload request from the client device;

transmitting, by the digital rights management system, a subset of the list of content distributors to the client device in response to authenticating the user from the redownload request, wherein the subset of the list of content distributors is usable by the client device to retrieve at least one of the first digital content from the content distributor and the additional digital content from the additional content distributor.

8. A digital rights management system comprising:

a processor; and

a non-transitory computer-readable medium communicatively coupled to the processor, wherein the processor is configured to execute computer instructions stored in the non-transitory computer-readable medium for performing operations comprising:

digitally signing a certificate with a private key in response to receiving a credentials request for a user from a client device via a data network, wherein the signed certificate is usable by the client device for authentication with multiple unaffiliated content distributors,

transmitting the signed certificate and a public key to the client device via the data network, wherein the public key corresponds to the private key,

receiving an unsigned license for digital content from a content distributor that has authenticated the client device using the signed certificate,

digitally signing the license by using the private key to encrypt a portion of the license, wherein the encrypted portion is decryptable by the client device using the public key provided to the client device with the signed certificate, and

transmitting the signed license to the first content distributor, wherein the signed license authorizes use of the first digital content by the client device.

9. The digital rights management system of claim **8**, wherein the operations further comprises transmitting an account number with the signed certificate and the public key, wherein the account number is usable for authenticating the user with the unaffiliated content distributors.

10. The digital rights management system of claim **8**, wherein the unsigned license comprises code for identifying the digital content at the content distributor, wherein the code cannot be used by the digital rights management system for identifying the digital content.

11. The digital rights management system of claim **8**, wherein the operations further comprise transmitting a digital media application for accessing the digital content to the client device and maintaining a record associating the transmitted digital media application and the signed certificate with the user.

12. The digital rights management system of claim 8, wherein the operations further comprise, subsequent to transmitting the signed certificate to the client device:

receiving a notification from the client device of a protected content transaction for the user with the content distributor, wherein the notification is associated with downloading the digital content from the content distributor and includes a network address for the first content distributor;

receiving an additional notification from the client device of an additional protected content transaction for the user with an additional content distributor, wherein the additional notification is associated with downloading additional digital content from the additional content distributor and includes an additional network address for the additional content distributor; and

maintaining a list of content distributors for the user using the notification and the additional notification received from the client device, wherein the list of content distributors includes the network address and the additional network address.

13. The digital rights management system of claim 12, wherein the network address for the content distributor and the additional network address for the additional content distributor comprises respective uniform resource locators for the content distributor and the additional content distributor.

14. The digital rights management system of claim 12, wherein the operations further comprise:

receiving a redownload request from the client device;

transmitting a subset of the list of content distributors to the client device in response to authenticating the user from the redownload request, wherein the subset of the list of content distributors is usable by the client device to retrieve at least one of the digital content from the content distributor and the additional digital content from the additional content distributor.

15. A non-transitory computer-readable medium storing computer instructions executable by a digital rights management system, the computer instructions comprising:

computer instructions for digitally signing a certificate with a private key in response to receiving a credentials request for a user from a client device via a data network, wherein the signed certificate is usable by the client device for authentication with multiple unaffiliated content distributors;

computer instructions for transmitting the signed certificate and a public key to the client device via the data network, wherein the public key corresponds to the private key;

computer instructions for receiving an unsigned license for digital content from a content distributor that has authenticated the client device using the signed certificate;

computer instructions for digitally signing the license by using the private key to encrypt a portion of the license, wherein the encrypted portion is decryptable by the client device using the public key provided to the client device with the signed certificate; and

computer instructions for transmitting the signed license to the content distributor, wherein the signed license authorizes use of the digital content by the client device.

16. The non-transitory computer-readable medium of claim 15, further comprising computer instructions for transmitting an account number with the signed certificate and the public key, wherein the account number is usable for authenticating the user with the unaffiliated content distributors.

17. The non-transitory computer-readable medium of claim 15, wherein the unsigned license comprises code for identifying the digital content at the content distributor, wherein the code cannot be used by the digital rights management system for identifying the digital content.

18. The non-transitory computer-readable medium of claim 15, further comprising computer instructions for, subsequent to transmitting the signed certificate to the client device:

receiving a notification from the client device of a protected content transaction for the user with the content distributor, wherein the notification is associated with downloading the digital content from the content distributor and includes a network address for the first content distributor;

receiving an additional notification from the client device of an additional protected content transaction for the user with an additional content distributor, wherein the additional notification is associated with downloading additional digital content from the additional content distributor and includes an additional network address for the additional content distributor; and

maintaining a list of content distributors for the user using the notification and the additional notification received from the client device, wherein the list of content distributors includes the first network address and the additional network address.

19. The non-transitory computer-readable medium of claim 18, wherein the network address for the content distributor and the additional network address for the additional content distributor comprises respective uniform resource locators for the content distributor and the additional content distributor.

20. The non-transitory computer-readable medium of claim 18, further comprising:

computer instructions for receiving a redownload request from the client device;

computer instructions for transmitting a subset of the list of content distributors to the client device in response to authenticating the user from the redownload request, wherein the subset of the list of content distributors is usable by the client device to retrieve at least one of the digital content from the content distributor and the additional digital content from the additional content distributor.

21. The method of claim 1, wherein digitally signing the license comprises:

creating a digital fingerprint for the digital content by applying a hash function to the digital content;

encrypting the digital fingerprint with the private key to generate a signed digital fingerprint, wherein the digital fingerprint is decryptable by the client device using the public key.

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